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EXAMINER	
JUETTNER, ANDREW MARK	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/590,357	Applicant(s) MORIN ET AL.	
	Examiner Andrew M. Juettner	Art Unit 4124	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 September 2006*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *16-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *16-28* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *23 August 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☒ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *23 August 2006*.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application

6) ☐ Other: _____.

DETAILED ACTION

1. Amendment received on August 23, 2006 has been acknowledged. Claims 1-15 have been cancelled. Newly presented claims 16-28 have been entered. Therefore, claims 16-28 are pending.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

3. Claim 25 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

The term "very" in claim 25 is a relative term which renders the claim indefinite. The term "very" is not defined by the claim, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably apprised of the scope of the invention. Claim 25 recites that the oxygen production membranes consist of very long tubes. Neither the specification nor the claim provides any guidance to how long a tube must be to fall within the limitation of very long.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 16, 19, and 20 are rejected under 35 U.S.C. 103(a) as being unpatentable over US Patent 6,505,567 to Anderson et al. (Anderson) in view of US Patent 5,326,550 to Adris et al. (Adris).

<u>In Reference to Claim 16</u>

Anderson teaches:

A circulating fluidized bed boiler (10) comprising:

a firebox (12) in which solid fuel is combusted in the presence of oxygen (column 4, lines 22-26) to generate flue gases containing solids (column 4, lines 37-40);

a separator (18) connected in fluid flow relation with the firebox (16 connects separator 18 with furnace section 12) for receiving the flue gases containing solids from the firebox and for separating the solids contained therein from the flue gases (column 4, lines 47-50);

a solids recirculation loop (26) connected in fluid flow relation with the separator (see fig. 1) for receiving from the separator the solids that are separated from the flue gases in the separator;

a solids extraction loop (see fig. 2, connection line, not labeled, between separator 18 and furnace 12, 26 not labeled, has another line branching off of it going to fluidized bed heat exchanger 36) connected in fluid flow relation with the solids recirculation loop for receiving from the solids recirculation loop at least a portion of the separated solids that are received by the solids recirculation loop from the separator (column 4, line 65-column 5, line 2);

a fluidized bed (36) containing fluidized solids connected both in fluid flow relation with the solids extraction loop (see fig. 2; column 4, line 65-column 5, line 2) for receiving from the solids extraction loop the portion of the separated solids that are received by the solids extraction loop from the solids recirculation loop and in fluid flow relation with the firebox (see fig. 2; column 5, lines 1-4) for recycling to the firebox the portion of the separated solids that are received by the fluidized bed from the solids extraction loop;

high temperature oxygen production membranes (oxygen source 140; column 6, lines 9-11);

pressurized air supplied to the fluidized bed (see fig. 2; blower 172 pushes fluidizing air into fluidized bed heat exchanger 36) so as to enable the high temperature oxygen production membranes in the fluidized bed to extract oxygen from the pressurized air; and

an oxygen loop (142 directs flow of oxygen from oxygen production membranes 140 to furnace 12) connected in fluid flow relation with the firebox for supplying the oxygen extracted from the pressurized air in the fluidized bed to be employed for purposes of effecting in the presence thereof the combustion of the solid fuel in the firebox.

Anderson does not disclose:

The high temperature oxygen production membranes supported in the fluidized bed so as to be exposed to the heat from the portion of the separated solids that are received by the fluidized bed in order to thereby maintain the high temperature oxygen production membranes within a desired temperature range for purposes of extracting oxygen from air; and

the oxygen loop connected in fluid flow relation with the fluidized bed.

Adris teaches selectively permeable membranes (34) located in a fluidized bed (12) and above it (See fig. 1 for fluidized bed reactor; see fig. 4 for membrane tubes directly exposed in fluidized bed, column 4, lines 48-56). The selectively permeable membranes disclosed in Adris are specifically directed to hydrogen selectively permeable membranes (column 4, lines 22-29) but the structures and materials for oxygen selectively permeable membranes are very closely related to those of the hydrogen selectively permeable membranes. It would have been obvious to one having ordinary skill in the art at the time of the invention to substitute oxygen selectively permeable membranes for hydrogen selectively permeable membranes in order to produce oxygen-enriched gas instead of hydrogen-enriched gas. The selectively

permeable membranes can be located in a fluidized bed near heat exchanger tubes (see fig. 1; separation tubes, which can be bare membranes 34-column 4, lines 57-58, are located in fluidized bed 12 near heat exchangers 36).

Based on the disclosure in Adris that selectively permeable membranes can be located in a fluidized bed, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed heat exchanger (36) of Anderson to include the oxygen production membranes (140) inside the fluidized bed as taught by Adris in order to reduce the number of separate components involved in the circulating fluidized bed assembly. The relocating of the oxygen production membranes (140) into the fluidized bed heat exchanger (36) would also move the connection line (142) so that the oxygen loop would be in fluid flow relation with both the firebox (12) and the fluidized bed (36).

<u>In Reference to Claim 19</u>

Anderson as modified by Adris teaches:

> The circulating fluidized bed boiler as claimed in claim 16 (see rejection of claim 16 above) wherein the hot temperature oxygen production membranes are supported within the fluidized solids in the fluidized bed (separation tubes 28, which can be bare membranes 34 as noted above, are located in fluidized bed solids 12; see fig. 1).

<u>In Reference to Claim 20</u>

Anderson as modified by Adris teaches:

The circulating fluidized bed boiler as claimed in claim 16 (see rejection of claim 16 above) wherein the hot temperature oxygen production membranes are supported above the fluidized solids in the fluidized bed (separation tubes 28, which can be bare membranes 34 as noted above, are located above the fluidized bed solids 12 in section 14; see fig. 1).

7. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris as applied to claim 16 above, and further in view of US Patent 5,852,925 to Prasad et al. (Prasad).

In Reference to Claim 17

Anderson as modified by Adris teaches the circulating fluidized bed boiler as claimed in claim 16 (see rejection of claim 16 above) but does not disclose wherein the pressurized air that is supplied to the fluidized bed is conveyed after the oxygen is extracted therefrom to a waste heat boiler.

Prasad teaches that the byproduct (316) from the membrane gas separation to is not going to be used for combustion can be conveyed to a heat exchanger (35) to recover heat in the form of steam for a power generation cycle (column 8, lines 6-10).

Although, Prasad teaches that the byproduct that is not used in combustion is the oxygen it would have been obvious to one having ordinary skill in the art at the time of the invention to attach the system and heat exchanger as taught by Prasad to the boiler assembly of Anderson as modified by Adris in order to recover heat from the byproduct stream coming from the membrane separator.

In Reference to Claim 18

Anderson as modified by Adris and Prasad teaches the circulating fluidized bed according to claim 18 (see rejection of claim 17 above), wherein the flue gases leaving the firebox are conveyed to a waste heat boiler (stream 314 can be feed to a combustor, see Prasad fig. 3, before being feed to heat exchanger 35) that is combined in a sealed manner to the waste heat boiler to which the pressurized air is conveyed after the oxygen is extracted therefrom (streams 314 and 316 both are feed to the same heat exchanger in parallel flow to recover heat from the streams).

8. Claims 21 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris as applied to claim 16 above, and further in view of US Patent 5,239,946 to Garcia-Mallol (Garcia-Mallol).

<u>In Reference to Claim 21</u>

Anderson as modified by Adris teaches:

A circulating fluidized bed boiler (10) comprising:

a firebox (12) in which solid fuel is combusted in the presence of oxygen (column 4, lines 37-40) to generate flue gases containing solids;

a separator (18) connected in fluid flow relation with the firebox (16 connects separator 18 with furnace section 12) for receiving the flue gases containing solids from the firebox and for separating the solids contained therein from the flue gases (column 4, lines 47-50);

a solids recirculation loop (26) connected in fluid flow relation with the separator (see fig. 1) for receiving from the separator the solids that are separated from the flue gases in the separator;

a solids extraction loop (se fig. 2, connection line, not labeled, between separator 18 and furnace 12, 26 not labeled has another line branching off of it going to fluidized bed heat exchanger 36) connected in fluid flow relation with the solids recirculation loop for receiving from the solids recirculation loop at least a portion of the separated solids that are received by the solids recirculation loop from the separator (column 4, line 65-column 5, line 2);

high temperature oxygen production membranes (oxygen source 140; column 6, lines 9-11);

air supplied to the high temperature oxygen production membranes (ambient air fed to oxygen source 140, which can be oxygen transport membrane column 6, lines 1-11) for purposes of effecting the extraction by the high temperature oxygen production membranes of oxygen from the air; and

an oxygen loop (142 directs flow of oxygen from oxygen production membranes 140 to furnace 12) for supplying the oxygen extracted from the air by the high temperature oxygen production membranes to the firebox to be employed for purposes of effecting in the presence thereof the combustion of the solid fuel in the firebox.

Anderson does not disclose:

High temperature oxygen production membranes supported on the lower periphery of the firebox so as to be exposed to sufficient heat to thereby maintain the high temperature oxygen production membranes within a desired temperature range for extraction of oxygen from air.

As indicated in the rejection of claim 16 above, Adris teaches selectively permeable membranes (34) located in a fluidized bed (12). As noted above, it would have been obvious one having ordinary skill in the art to use oxygen selectively permeable membranes in a fluidized bed. Based on the disclosure in Adris that selectively permeable membranes can be located in a fluidized bed, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed heat exchanger (36) of Anderson to include the oxygen production membranes (140) inside the fluidized bed as taught by Adris in order to reduce the number of separate components involved in the circulating fluidized bed assembly.

Garcia-Mallol teaches a fluidized bed combustion system (see fig. 1) that has a heat exchanger (36) located along the outside of a wall of the firebox (18). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed boiler system of Anderson to locate the fluidized bed heat exchanger along the outside of a wall of the firebox as taught by Garcia-Mallol in order to reduce the number of individual units in the assembly, reduce the number of connection lines, and improve efficiency. The resulting structure has oxygen production membranes located in the fluidized bed heat exchanger outside a lower periphery wall of the firebox. Therefore, claim 21 is obvious in view of Anderson in view of Adris and in further view of Garcia-Mallol.

<u>In Reference to Claim 22</u>

Anderson as modified by Adris and Garcia-Mallol teaches:

The circulating fluidized bed boiler as claimed in claim 21 (see rejection of claim 21 above) wherein the high temperature oxygen production membranes are placed outside of the firebox (Anderson as modified by Adris teaches that the oxygen production membranes 140 of Anderson are located in the fluidized bed heat exchanger as taught by Adris, the fluidized bed heat exchanger of Anderson as modified by Garcia-Mallol locates in on the outside of the a lower periphery wall of the firebox; see Garcia-Mallol fig. 1, heat exchanger 36 is outside of firebox 18).

9. Claims 21 and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris as applied to claim 16 above, and further in view of US Patent 5,054,436 to Dietz (Dietz).

<u>In Reference to Claim 21</u>

Anderson as modified by Adris teaches:

A circulating fluidized bed boiler (10) comprising:

a firebox (12) in which solid fuel is combusted in the presence of oxygen (column 4, lines 37-40) to generate flue gases containing solids;

a separator (18) connected in fluid flow relation with the firebox (16 connects separator 18 with furnace section 12) for receiving the flue gases containing solids from the firebox and for separating the solids contained therein from the flue gases (column 4, lines 47-50);

a solids recirculation loop (26) connected in fluid flow relation with the separator (see fig. 1) for receiving from the separator the solids that are separated from the flue gases in the separator;

a solids extraction loop (se fig. 2, connection line, not labeled, between separator 18 and furnace 12, 26 not labeled has another line branching off of it going to fluidized bed heat exchanger 36) connected in fluid flow relation with the solids recirculation loop for receiving from the solids recirculation loop at least a portion of the separated solids that are received by the solids recirculation loop from the separator (column 4, line 65-column 5, line 2);

high temperature oxygen production membranes (oxygen source 140; column 6, lines 9-11);

air supplied to the high temperature oxygen production membranes (ambient air fed to oxygen source 140, which can be oxygen transport membrane column 6, lines 1-11) for purposes of effecting the extraction by the high temperature oxygen production membranes of oxygen from the air; and

an oxygen loop (142 directs flow of oxygen from oxygen production membranes 140 to furnace 12) for supplying the oxygen extracted from the air by the high temperature oxygen production membranes to the firebox to be employed for purposes of effecting in the presence thereof the combustion of the solid fuel in the firebox.

Anderson does not disclose:

> High temperature oxygen production membranes supported on the lower periphery of the firebox so as to be exposed to sufficient heat to thereby maintain the high temperature oxygen production membranes within a desired temperature range for extraction of oxygen from air.

As indicated in the rejection of claim 16 above, Adris teaches selectively permeable membranes (34) located in a fluidized bed (12). As noted above, it would have been obvious one having ordinary skill in the art to use oxygen selectively permeable membranes in a fluidized bed. Based on the disclosure in Adris that selectively permeable membranes can be located in a fluidized bed, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed heat exchanger (36) of Anderson to include the oxygen production membranes (140) inside the fluidized bed as taught by Adris in order to reduce the number of separate components involved in the circulating fluidized bed assembly.

Dietz teaches a fluidized bed combustion system (see fig. 1) that has a heat exchanger section (24) located in the firebox (10). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed boiler system of Anderson to locate the fluidized bed heat exchanger in the firebox as taught by Dietz in order to reduce the number of individual units, reduce the number of connection lines, and improve efficiency. The resulting structure has oxygen production membranes located in the fluidized bed heat exchanger on the lower periphery of the firebox. Therefore, claim 21 is obvious in view of Anderson in view of Adris and in further view of Dietz.

In Reference to Claim 23

Anderson as modified by Adris and Dietz teaches:

The circulating fluidized bed boiler as claimed in claim 21 (see rejection of claim 21 above) wherein the high temperature oxygen production membranes are placed along the inside walls of the firebox (oxygen production membranes 140 of Anderson are located in the fluidized bed heat exchanger as taught by Adris, the fluidized bed heat exchanger of Anderson as modified by Dietz is on the inside wall of the firebox; see Dietz fig.1, heat exchanger 24 with tubes along wall 12b).

10. Claims 24 and 25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris as applied to claim 16 above, and further in view of US Patent 6,532,905 to Belin et al. (Belin).

In Reference to Claim 24

Anderson as modified by Adris teaches:

A circulating fluidized bed boiler (10) comprising:

a firebox (12) in which solid fuel is combusted in the presence of oxygen (column 4, lines 22-26) to generate flue gases containing solids (column 4, lines 37-40);

a separator (18) connected in fluid flow relation with the firebox (16 connects separator 18 with furnace section 12) for receiving the flue gases containing solids from the firebox and for separating the solids contained therein from the flue gases (column 4, lines 47-50);

a solids recirculation loop (26) connected in fluid flow relation with the separator (see fig. 1) for receiving from the separator the solids that are separated from the flue gases in the separator;

a solids extraction loop (see fig. 2, connection line, not labeled, between separator 18 and furnace 12, 26 not labeled, has another line branching off of it going to fluidized bed heat exchanger 36) connected in fluid flow relation with the solids recirculation loop for receiving from the solids recirculation loop at least a portion of the separated solids that are received by the solids recirculation loop from the separator (column4, line 65-column 5, line 2);

high temperature oxygen production membranes (oxygen source 140; column 6, lines 9-11);

air supplied to the high temperature oxygen production membranes (ambient air fed to oxygen source 140, which can be oxygen transport membrane column 6, lines 1-11) for purposes of effecting the extraction by the high temperature oxygen production membranes of oxygen from the air; and

an oxygen loop (142 directs flow of oxygen from oxygen production membranes 140 to furnace 12) for supplying the oxygen extracted from the air by the high temperature oxygen production membranes to the firebox to be employed for purposes of effecting in the presence thereof the combustion of the solid fuel in the firebox.

Anderson does not disclose:

> High temperature oxygen production membranes supported as an assembly resting on the hearth of the firebox so as to be exposed to sufficient heat to thereby maintain the high temperature oxygen production membranes within a desired temperature range for extraction of oxygen from air.

As indicated in the rejection of claim 16 above, Adris teaches selectively permeable membranes (34) located in a fluidized bed (12). As noted above, it would have been obvious one having ordinary skill in the art to use oxygen selectively permeable membranes in a fluidized bed. Based on the disclosure in Adris that selectively permeable membranes can be located in a fluidized bed, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed heat exchanger (36) of Anderson to include the oxygen production membranes (140) inside the fluidized bed as taught by Adris in order to reduce the number of separate components involved in the circulating fluidized bed assembly.

Belin teaches a fluidized bed boiler (10) with a fluidized heat exchanger (42) with tubes (56, column 5, lines 4-7) located in the furnace enclosure (12) on the hearth (see fig. 1). It would have been obvious to one having ordinary skill in the art at the time of the invention to modify the fluidized bed boiler assembly of Anderson by locating the fluidized bed heater exchanger of Anderson inside the furnace as taught by Belin in order to simplify the overall construction of the circulating fluidized bed assembly and to permit easy access to enclosure walls for maintenance and inspections as explicitly taught by Belin (Column 1, lines 65-67). The resulting structure has oxygen production membranes located on the hearth of furnace section (see Belin fig. 1; 42 is located on

hearth of firebox 12). Therefore, claim 24 is obvious in view of Adris and in further view of Belin.

In Reference to Claim 25

Anderson as modified by Adris and Belin teaches:

> The circulating fluidized bed boiler as claimed in claim 24 (see rejection of claim 24 above) wherein the high temperature oxygen production membranes consist of very long tubes supported by intermediate plates (see Adris fig. 1; tubes 28 may be directly exposed perm selective membranes 34, column 4, lines 48-49, which extend through enclosure 10 supported by the distributor plate 16 the floor of the blow box 18 and the ceiling to enclosure 10).

11. Claim 26 is rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris and Belin as applied to claim 24 above, and further in view of US Patent 5,284,583 to Rogut (Rogut). Anderson as modified by Adris and Belin teach a circulating fluidized bed boiler as claimed in claim 24 (see rejection of claim 24 above), but does not disclose wherein the high temperature oxygen production membranes consist of short tubes with intermediate chambers.

Rogut teaches wherein the high temperature oxygen production membranes (14) consist of short tubes (membranes with long fibers operate at too low of a productivity level, column 2, lines 12-16, the fibers should be in the range of 0.2 to 100 cm, column 3, lines 15-19) with intermediate chambers (transport arteries 12, see figs. 9A, 9B, 15, 16).

It would have been obvious to one having ordinary skill in the art at the time of the invention to substitute the membrane arrangement as taught by Rogut for the membranes of Anderson as modified by Adris in order to increase the productivity efficiency of the oxygen production membranes.

12. Claims 27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Anderson in view of Adris and Belin as applied to claim 24 above, and further in view of US Patent 7,125,528 to Besecker et al (Besecker).

In Reference to Claim 27

Anderson as modified by Adris and Belin teaches a circulating fluidized bed boiler substantially according to claim 27 (see rejection of claim 24 above), but does not disclose wherein the high temperature oxygen production membranes consist of concentric tubes of which the inner tube serves as support for the outer tube.

Besecker teaches wherein the high temperature oxygen production membranes (52) consist of concentric tubes (54, 56; see fig. 5) of which the inner tube serves as support for the outer tube.

It would have been obvious to one having ordinary skill in the art at the time of the invention to substitute the 2 concentric tubes as taught by Besecker for the membrane tube taught by Adris in order to allow for a catalytic reaction to take place after the oxygen is separated from the oxygen-containing gas (column 5, lines 24-27).

In Reference to Claim 28

Anderson as modified by Adris, Belin and Besecker teaches:

The circulating fluidized bed boiler as claimed in claim 27 (see rejection of claim 27 above) wherein a space is provided between the two tubes (see fig. 5; column 6, lines 40-47).

Conclusion

13. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Kuipers et al. discloses oxygen transport membranes in a fluidized bed. Roy et al. discloses hydrogen membranes in a fluidized bed. Grace et al. discloses perm-selective membranes located in a fluidized bed. Schwartz et al. discloses oxygen transport membranes in a fluidized bed of catalyst. Zaromb discloses a porous membrane that allows oxygen transport in communication with fluidized particles. Maeda discloses catalyst tubes located in and above a fluidized bed in a furnace. Bool ‘958 discloses heating air in a furnace before passing through oxygen transport membranes. Shah et al. discloses a boiler assembly with integrated oxygen transport membranes. Ronney discloses transport membranes with heat exchanger tubes in an intermediate area. Mazanee et al. discloses concentric tube membrane structures. Stein et al. discloses an ion transport membrane system. Prasad et al. ‘494 discloses oxygen transport membranes arranged in series.

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Andrew M. Juettner whose telephone number is (571) 270-5053. The examiner can normally be reached on Monday through Friday 7:30am to 5pm Est..

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kenneth Bomberg can be reached on (571) 272-4922. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

15. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

AMJ
/A. M. J./

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Primary Examiner, Art Unit 3742